

CLAIMS

We claim:

- 5 1. A spindle lock for a power tool, the power tool including a housing, a motor supported by the housing and including a motor shaft, and a spindle supported by the housing for rotation about an axis, a driving connection being provided between the spindle and the motor shaft such that the spindle is drivingly connectable to the motor shaft, the spindle being selectively driven by the motor in a first direction about the axis and in a second direction about the axis, the second direction being opposite to the first direction, said spindle lock comprising:
- 10 a first locking member defining a first locking surface;
 a second locking member defining a second locking surface;
 a wedge positioned between the first locking member and the second locking member and positionable in a locked position, in which the wedge is wedged between the first locking surface and the second locking surface to prevent rotation of the spindle, and in an unlocked position;
- 15 a spring operable to delay movement of the wedge from the unlocked position to the locked position and being flexible in a direction generally parallel to the axis when a force is applied to the spindle to cause the spindle to rotate relative to the driving connection; and
- 20 a detent arrangement including
 a first recess and a second recess, and
 a projection engaged by the spring, the projection being selectively positioned in the first recess and in the second recess;
- 25 wherein, when the spindle is rotated in the first direction relative to the driving connection, the projection is movable between a first position, which corresponds to the unlocked position of the wedge and in which the projection is positioned in the first recess, and a second position, in which the projection is positioned in the second recess, movement of the projection from the first recess delaying movement of the wedge from the unlocked position to the locked position when the spindle is rotated in the first direction relative to the driving connection; and
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wherein, when the spindle is rotated in the second direction relative to the driving connection, the projection is movable between the second position, which corresponds to the unlocked position of the wedge and in which the projection is positioned in the second recess, and the first position, in which the projection is positioned in the first recess, movement of the projection from the second recess delaying movement of the wedge from the unlocked position to the locked position when the spindle is rotated in the second direction relative to the driving connection.

2. The spindle lock of claim 1, wherein the wedge and at least one of the first and second locking members include inter-engaging teeth engageable to prevent rotation of the spindle when the wedge is in the locked position.

3. The spindle lock of claim 1, wherein the wedge defines a wedge axis, and wherein the spindle lock further comprises an alignment member engageable with the wedge to maintain the wedge in an orientation in which the wedge axis is parallel to the spindle axis.

4. The spindle lock of claim 3, wherein the wedge has an outer surface and a length, wherein the first locking surface and the second locking surface extend parallel to the spindle axis, and wherein the alignment member maintains the wedge in an orientation in which the wedge axis is parallel to the first locking surface and the second locking surface such that, in the locked position, a first portion of the outer surface engages the first locking surface along a substantial portion of the length of the wedge and a second portion of the outer surface engages the second locking surface along a substantial portion of the length of the wedge.

5. The spindle lock of claim 3, wherein the alignment member defines a camming surface, at least a portion of the wedge being cammingly engageable with the camming surface for movement between the locked position and the unlocked position.

6. The spindle lock of claim 1, further comprising:

a second wedge positioned between the first locking member and the second locking member and positionable in a locked position, in which the wedge is wedged between the first locking surface and the second locking surface to prevent rotation of the spindle, and in an unlocked position; and

a synchronizing member engageable with the first-mentioned wedge and the second wedge such that the first-mentioned wedge and the second wedge simultaneously move to the respective locked positions.

7. The spindle lock of claim 1, when the spindle is rotated in the first direction relative to the motor shaft, the spring applies a first spring force to the projection to bias the projection into the first recess and to delay movement of the second locking member from the unlocked position to the locked position, and wherein, when the spindle is rotated in the second direction relative to the motor shaft, the spring applies a second spring force to the projection to bias the projection into the second recess and to delay movement of the second locking member from the unlocked position to the locked position, the second spring force and the first spring force being substantially equal.

8. The spindle lock of claim 1, further comprising a second spring positioned between the wedge and the first locking surface, the second spring biasing the wedge toward the unlocked position.

9. The spindle lock of claim 1, wherein the first locking member defines a drag surface, and wherein the spindle lock further comprises a drag element positioned adjacent to the drag surface and being engageable with the drag surface to resist rotation of the second locking member about the axis and relative to the first locking member.

10. A spindle lock for a power tool, the power tool including a housing, a motor supported by the housing and including a motor shaft, and a spindle supported by the housing for rotation about an axis, a driving connection being provided between the spindle and the motor shaft such that the spindle is drivingly connectable to the motor shaft, the spindle being selectively driven by the motor in a first direction about the axis and in a second direction about the axis, the second direction being opposite to the first direction, said spindle lock comprising:

a first locking member;

a second locking member movable between a locked position, in which the second locking member engages the first locking member to prevent rotation of the spindle, and an unlocked position;

a spring operable to delay movement of the second locking member from the unlocked position to the locked position when a force is applied to the spindle to cause the spindle to rotate relative to the driving connection, the spring including a first recess and a second recess; and

a projection being engaged by the spring, at least a portion of the projection being selectively positioned in the first recess and the second recess;

wherein, when the spindle is rotated in the first direction relative to the driving connection, the projection is movable between a first position, which corresponds to the unlocked position of the second locking member and in which the projection is positioned in the first recess, and a second position, in which the projection is positioned in the second recess, movement of the projection from the first recess delaying movement of the second locking member from the unlocked position to the locked position when the spindle is rotated in the first direction relative to the driving connection; and

wherein, when the spindle is rotated in the second direction relative to the driving connection, the projection is movable between the second position, which corresponds to the unlocked position of the second locking member and in which the projection is positioned in the second recess, and the first position, in which the projection is positioned in the first recess, movement of the projection from the second recess delaying movement of the second locking member from the unlocked position to the locked position when the spindle is rotated in the second direction relative to the driving connection.

11. The spindle lock of claim 10, wherein, when the spindle is rotated in the first direction relative to the motor shaft, the spring applies a first spring force to the projection to bias the projection into the first recess and to delay movement of the second locking member from the unlocked position to the locked position, and wherein, when the
5 spindle is rotated in the second direction relative to the motor shaft, the spring applies a second spring force to the projection to bias the projection into the second recess and to delay movement of the second locking member from the unlocked position to the locked position, the second spring force and the first spring force being substantially equal.

10 12. The spindle lock of claim 10, wherein the spring applies a spring force to the projection to bias the projection into a selected one of the first recess and the second recess.

13. The spindle lock of claim 12, wherein the spring applies the spring force to
15 the projection in an axial direction to bias the projection into the selected one of the first recess and the second recess.

14. The spindle lock of claim 12, wherein, when the spindle is rotated in the first direction, the second position of the projection corresponds to the locked position of
20 the second locking member, and wherein, when the spindle is rotated in the first direction, the projection engages the second recess to releasably maintain the second locking member in the locked position.

15. The spindle lock of claim 14, wherein, when the spindle is rotated in the second direction, the first position of the projection corresponds to the locked position of
25 the second locking member, and wherein, when the spindle is rotated in the second direction the projection engages the first recess to releasably maintain the second locking member in the locked position.

30 16. The spindle lock of claim 10, further comprising a second spring positioned adjacent to the second locking member, the second spring biasing the wedge toward the unlocked position, the wedge being movable toward the locked position when a force is applied to the spindle to cause the spindle to rotate relative to the driving connection in the first direction about the axis.

17. A spindle lock for a power tool, the power tool including a housing, a motor supported by the housing and including a motor shaft, and a spindle supported by the housing for rotation about an axis, a driving connection being provided between the spindle and the motor shaft such that the spindle is drivingly connectable to the motor shaft, the spindle lock comprising:

a first locking member defining a first locking surface and a drag surface;

a second locking member movable between a locked position, in which the second locking member engages the first locking member to prevent rotation of the spindle, and an unlocked position; and

a drag element positioned adjacent to the drag surface and being engageable with the drag surface to resist rotation of the second locking member with respect to the first locking member when a force is applied to the spindle to cause the spindle to rotate relative to the driving connection and when the force is removed from the spindle.

18. The spindle lock of claim 17, further comprising a delay plate positioned adjacent to the first locking member and operable to apply an axial force to the drag element and the drag surface and to resist rotation of the second locking member with respect to the first locking member.

19. The spindle lock of claim 17, wherein the first locking member defines a groove extending circumferentially around the drag surface, the groove housing at least a portion of the drag element.

20. The spindle lock of claim 19, further comprising a delay plate positioned adjacent to the first locking member and having a contoured recess, the drag element being housed in the groove and in the contoured recess of the delay plate.

21. The spindle lock of claim 17, wherein the first and second locking surfaces include inter-engaging teeth, resistance between the drag element and the drag surface delaying rotation of the second locking member with respect to the first locking member and aligning the teeth of the second locking surface with the teeth of the first locking surface.